2025 UPDATE TO THE UTAH QUATERNARY FAULT DATABASE

by

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INTRODUCTION AND BACKGROUND

The Utah Geological Survey (UGS) maintains a database of Quaternary-active faults in Utah as a layer on the *Utah Geologic Hazards Portal* web map. This database was previously titled the Utah Quaternary Fault and Fold Database (UQFFD) before its inclusion on the *Utah Geologic Hazards Portal*.

The first Quaternary fault map of Utah was produced at a scale of 1:500,000 by Anderson and Miller (1979). Hecker (1993) produced the first true Quaternary faults compilation and database for Utah, around the same time Haller et al. (1993) published guidelines for creating Quaternary fault databases and maps from the U.S Geological Survey (USGS). This initial UQFFD compilation consolidated and synthesized all the available information on Quaternary faulting, folding, and volcanism throughout Utah. This compilation also includes approximate ages of most recent fault movement, slip rate, and recurrence interval data (Hecker, 1993). Subsequently, Black et al. (2003) produced an updated Quaternary fault map of Utah. In the 2010s, the Black et al. (2003) map was the basis for the UGS creating a web map version of the UQFFD, which has since been incorporated into the *Utah Geologic Hazards Portal* and re-titled the *Utah Quaternary Fault Database* (UQFD).

Quaternary-active faults have routinely been added to the UQFD based on new geologic maps and geologic hazard mapping across the state of Utah. Leveraging supplemental funding from the USGS Earthquake Hazards External Grants Program, the Geologic Hazards Program at the UGS has completed several extensive lidar-based, fault remapping projects focused around urban and developing areas in Utah (Hiscock and Hylland, 2015; McDonald et al., 2020; Hiscock et al., 2021; Knudsen et al., 2021; Hiscock et al., 2024; Hiscock et al., 2025). As updates are made to the UQFD, they are sent to the USGS for inclusion in the *Quaternary Fault and Fold Database of the United States*. The USGS is often delayed in getting updates from individual states databases integrated into the *Quaternary Fault and Fold Database of the United States*, therefore, the UGS recommends using the UQFD on the *Utah Geologic Hazards Portal* and the *Utah Quaternary Faults* layer on the Utah Geospatial Reference Center's State Geographic Information Datasource (SGID; UGRC, undated) for the most up-to-date fault mapping data. These data are also used to update the USGS National Seismic Hazard Maps.

This data release is intended to supplement the UGS's large-scale fault mapping projects by incorporating newly mapped Quaternary-active faults from recently published geologic maps and other miscellaneous peer-reviewed publications. All faults included in the UQFD have gone through a peer-review process required for inclusion (see Carney et al., 2024 for an explanation of the UGS's review process).

METHODS

Data included here is from multiple publications (Table 1). Two feature classes are contained in the included GIS geodatabase; one with only the faults discussed in Table 1, and one with the full UQFD, which is also available through the *Utah Geologic Hazards Portal* and the *Utah Quaternary Faults* layer on the SGID. Several of the faults also include updates to associated surface-fault-rupture special-study-zones (SSZs). Only faults with previously delineated and published SSZs (McDonald et al., 2020) include updated SSZ's. The GIS geodatabase includes two SSZ feature classes: one with the newly updated SSZ's, and one with all SSZ's available for Utah, which are also available through the *Utah Geologic Hazards Portal*. For a complete description of how these zones are delineated, see Lund et al. (2020) and Hiscock et al. (2025). Included faults are attributed following the conventions used in the *Utah Geologic Hazards Portal* and previous UGS fault mapping publications (McDonald et al., 2020; Hiscock et al., 2024; Hiscock et al., 2025). Fault attributes (described below) include fault/fault zone name, fault segment name (if applicable), structure/fault number, mapped scale, fault dip direction, fault mapping constraint, slip sense, slip rate category, structure class, and structure age category. These attributes generally follow those established by Haller et al. (1993) for the USGS *Quaternary Fault and Fold Database of the United States*.

Table 1. *New Quaternary-active faults included in this data release, listed by FaultNum field.*

FaultNum	Fault Name	Citation	Notes	Special-Study Zones Included
2351f	Wasatch fault zone, Salt Lake City section	Anderson et al., 2024; McKean and Anderson, 2024	New fault geometries from two new 7.5-minute geologic maps.	Yes
2351e	Wasatch fault zone, Weber section	Anderson, 2023; Anderson et al., 2024	Removed previously mapped traces based on updated 7.5-minute geologic mapping.	Removed
2393	Diamond Gulch faults	Sprinkel, 2006	New fault geometries from 30x60 geologic map.	No
2394	Pot Creek faults	Sprinkel, 2006	New fault geometries from 30x60 geologic map.	No
2401	Towanta Flat graben	Sprinkel, 2024	New fault geometries from 30x60 geologic map.	No
2414	Duchesne-Pleasant Valley fault system	Sprinkel, 2007; Sprinkel, 2024	New fault geometries from 30x60 geologic maps.	No
2408	Selma fault	McKean et al., 2020	New fault geometries from 7.5-minute geologic map; renamed from “Cedar Valley (South Side) fault” to “Selma fault.”	No
2485	Wah Wah Mountains (South End Near Lund) fault	Rowley et al., 2006	New fault geometries from 30x60 geologic map.	No
2487	Black Mountains faults	Rowley et al., 2019	New fault geometries from 30x60 geologic map.	No
2489	Mineral Mountains (West Side) fault	Knudsen et al., 2019; Rowley et al., 2019; Rowley et al., 2020	New fault geometries from UGS MP-169B and 30x60 geologic maps.	No
2490	Mineral Mountains (Northeast Side) fault	Knudsen et al., 2019; Rowley et al., 2020	New fault geometries from UGS MP-169B and 30x60 geologic map.	No
2491	Cove Fort fault zone	Rowley et al., 2020	New fault geometries from 30x60 geologic map.	No
2492a	Beaver Basin faults, Eastern Margin section	Rowley et al., 2019; Rowley et al., 2020	Renamed from “Eastern Margin faults section” to “Eastern Margin section.” New fault geometries from 30x60 geologic maps.	No
2492b	Beaver Basin faults, Intrabasin section	Rowley et al., 2019; Rowley et al., 2020	Renamed from “Intrabasin faults section” to “Intrabasin section.” New fault geometries from 30x60 geologic maps.	No
2495	Fremont Wash faults	Rowley et al., 2019	New fault geometries from 30x60 geologic map.	No
2498	Spry Area faults	Rowley et al., 2005; Hiscock et al., 2025	No longer considered Quaternary-active, removed faults.	No
2499	Buckskin Valley faults (class B)	Rowley et al., 2019	New fault geometries from 30x60 geologic map.	No
2516	Enterprise fault	Rowley et al., 2006	New fault geometries from 30x60 geologic map.	No
2517	Antelope Range fault	Rowley et al., 2006; Biek et al., 2010	New fault geometries from 30x60 geologic maps.	No
2526	Escalante Desert (East Side) faults	Rowley et al., 2006	New fault geometries from 30x60 geologic map.	No
2528	Enoch Graben fault	Rowley et al., 2006	New fault geometries from 30x60 geologic map.	No
2529	Cedar Valley (north end) faults	Rowley et al., 2019	New fault geometries from 30x60 geologic map.	No
2533	Parowan Valley faults	Rowley et al., 2019	New fault geometries from 30x60 geologic map.	No
2534	Paragonah fault	Rowley et al., 2019	New fault geometries from 30x60 geologic map.	No
2535	Markagunt Plateau faults	Rowley et al., 2019; Knudsen, 2024	New fault geometries from 30x60 geologic map and 7.5-minute geologic map.	No
2542	East Cedar Valley fault zone	McKean, 2020	New fault geometries from 7.5-minute geologic map.	No
2544	Wide Canyon faults	Biek et al., 2010	New fault geometries from 30x60 geologic map.	No
2550	Unnamed Quaternary faults	Rowley et al., 2006	New fault geometries from 30x60 geologic maps.	No
2553	Opal Mound fault	Knudsen et al., 2019; Rowley et al., 2020	Parts of the Opal Mound fault are class C; New FaultNum and fault geometries.	No
2554	Mag Wash fault	Knudsen et al., 2019; Rowley et al., 2020	New FaultNum and fault geometries.	No

EXPLANATION OF GIS ATTRIBUTE FIELDS

ObjectID (ObjectID)
Standard field. Maintained/updated automatically by GIS software.

Shape (Geometry)
Standard field. Maintained/updated automatically by GIS software.

FaultNum (String, text)
Fault number in accordance with the USGS *Quaternary Fault and Fold Database of the United States*. Fault numbers can be found in the UGS database, or with the USGS database search.

FaultZone (String)
Fault zone name, applied to faults comprising two or more named sections (equivalent to faults in the database that have an assigned fault number and letter). Based on the *USGS Quaternary Fault and Fold Database of the United States*.

FaultName (String)
Fault name, applied to faults that are not subdivided into named sections (equivalent to faults in the database that have an assigned fault number, but no letter). Based on the USGS *Quaternary Fault and Fold Database of the United States*.

SectionName (String)
Fault zone section name, applied to named subdivisions of a fault zone (equivalent to faults in the database that have a letter appended to the fault number). Based on the USGS *Quaternary Fault and Fold Database of the United States*.

StrandName (String)
Named subdivision of a section of a fault zone, formal or informal. Based on the USGS *Quaternary Fault and Fold Database of the United States*.

MappedScale (String, text)
Scale of fault trace mapping.

Options:
- 1:10,000
- 1:24,000
- 1:42,240
- 1:50,000
- 1:60,000
- 1:62,500
- 1:89,700
- 1:95,000
- 1:100,000
- 1:125,000
- 1:155,000
- 1:170,000
- 1:250,000
- 1:266,000
- 1:340,000
- 1:500,000
- 1:700,000
- 1:750,000

DipDirection (String, text)
General direction of fault dip, given in terms of eight primary compass directions.

Options:
- north
- northeast
- east
- southeast
- south

southwest
west
northwest
unspecified

SlipSense (String, text)
Fault displacement or offset sense, principal sense first for combinations.
Options: anticline
left lateral
monocline
normal
reverse
right lateral
syncline
unknown

SlipRate (String, text)
Approximate fault slip rate. Based on the USGS *Quaternary Fault and Fold Database of the United States* slip rate bins.
Options: >5 mm/yr
1 – 5 mm/yr
0.2 – 1 mm/yr
<0.2 mm/yr
undetermined

MappingConstraint (String, text)
Mapped fault confidence. See Hiscock et al. (2025) for an in-depth description.
Options: well constrained
moderately constrained
inferred
unknown

FaultClass (String, text)
Based on fault classes established by Crone and Wheeler (2000).
Options: class A
class B
class C

FaultAge (String, text)
Timing of the most recent ground deformation (surface faulting or faulting).
Options: <150
<15,000
<130,000
<750,000
<2,600,000
undetermined

USGS_Link (String, text/url)
Link to the archived fault report in the USGS *Quaternary Fault and Fold Database of the United States*.

Citation (String, text)
Short reference for the study that the fault was mentioned in (where available).

Citation_Link (String, text/url)
Link (DOI page) to the associated publication (where available).

Shape_Length (Double)
Standard field. Maintained/updated automatically by GIS software.

REFERENCES

Anderson, L.W., and Miller, D.G., 1979, Quaternary fault map of Utah: Long Beach, California, Fugro, Inc, 35 p., pamphlet, scale 1:500,000, https://geodata.geology.utah.gov/pages/view.php?ref=29983.

Anderson, Z.W., 2023, Geologic map of the Bountiful Peak quadrangle, Davis and Morgan Counties, Utah: Utah Geological Survey Map 298DM, 17 p., 2 plates, scale 1:24,000, https://doi.org/10.34191/M-298DM.

Anderson, Z.W., McKean, A.P., and Yonkee, A.W., 2024, Interim geologic map of the Fort Douglas quadrangle, Salt Lake, Davis, and Morgan Counties, Utah: Utah Geological Survey Open-File Report 767, 32 p., 2 plates, scale 1:24,000, https://doi.org/10.34191/OFR-767.

Biek, R.F., Rowley, P.D., Hayden, J.M., Hacker, D.B., Willis, G.C., Hintze, L.F., Anderson, R.E., Brown, K.D., 2010, Geologic map of the St. George and east part of the Clover Mountains 30' x 60' quadrangles, Washington and Iron Counties, Utah: Utah Geological Survey Map 242DM, 101 p., 2 plates, 1:100,000 scale, https://doi.org/10.34191/M-242dm.

Black, B.D., Hecker, S., Hylland, M.D., Christensen, G.E., and McDonald, G.N., 2003, Quaternary fault and fold database and map of Utah: Utah Geological Survey Map M-193DM, 23 p., 1 plate, scale 1:500,000, https://doi.org/10.34191/M-193dm.

Carney, S.M., Hylland, M.D., Lund, W.R., and Ressetar, R., 2024, Guide for the preparation of reports for the Utah Geological Survey, fourth edition: Utah Geological Survey Circular 137, 63 p., 6 appendices, https://doi.org/10.34191/C-137.

Crone, A.J. and Wheeler, R.L., 2000, Data for Quaternary faults, liquefaction features, and possible tectonic features in the Central and Eastern United States, east of the Rocky Mountain front: U.S. Geological Survey Open-File Report 00-260, 342 p., https://doi.org/10.3133/ofr00260.

Haller, K.M., Machette, M.N., and Dart, R.L., 1993, Maps of major active faults, Western Hemisphere, International Lithosphere Program (ILP) Project II-2—Guidelines for U.S. database and map: U.S. Geological Survey Open-File Report 93-338, 45 p., https://doi.org/10.3133/ofr93338.

Hecker, S., 1993, Quaternary tectonics of Utah with emphasis on earthquake-hazard characterization: Utah Geological Survey Bulletin 127, 157 p., scale 1:500,000, https://doi.org/10.34191/B-127.

Hiscock, A.I., and Hylland, M.D., 2015, Surface fault rupture hazard maps of the Levan and Fayette segments of the Wasatch fault zone, Juab and Sanpete Counties, Utah: Utah Geological Survey Open-File Report 640, 7 plates, scale 1:24,000, https://doi.org/10.34191/OFR-640.

Hiscock, A.I., Kleber, E.J., Jänecke, S.U., McDonald, G.N., Oaks, R.Q., Jr., and Rittenour, T., 2024, Fault trace mapping and surface-fault-rupture special study zone delineation of the East and West Cache fault zones and other regional faults, Utah: Utah Geological Report of Investigation 286, 27 p., 1 appendix, https://doi.org/10.34191/RI-286.

Hiscock, A.I., Knudsen, T.R., and Adam, R.N., 2025, Fault trace mapping and surface-fault-rupture special study zone delineation of quaternary-active faults in central Utah, Garfield, Juab, Millard, Piute, Sanpete, and Sevier Counties, Utah: Utah Geological Survey Report of Investigation 293, 26 p., https://doi.org/10.34191/RI-293.

Hiscock, A.I., Lifton, Z.M., McDonald, G.N., and Kleber, E.J., 2021, Detailed mapping of the east and west Bear Lake fault zones, Utah and Idaho, and the Oquirrh, Southern Oquirrh Mountains, Topliff Hills, and Rush Valley fault zones, Utah—Using new high-resolution lidar data to reduce earthquake risk: Final Technical Report to the U.S. Geological Survey, National Earthquake Hazards Reduction Program, award nos. G19AP00072 and G19AP00073, 35 p., https://geodata.geology.utah.gov/pages/view.php?ref=65364.

Knudsen, T.R., Hiscock, A.I., Ben-Horin, J., and Pearthree, P.A., 2021, Detailed mapping of the Washington, Hurricane, and Sevier/Toroweap fault zones, Utah and Arizona—Using new high-resolution lidar data to reduce earthquake risk: Final Technical Report to the U.S. Geological Survey, National Earthquake Hazards Reduction Program, award nos. G20AP0007 and G20AP0008, 36 p., https://geodata.geology.utah.gov/pages/view.php?ref=65953.

Knudsen, T., Kleber, E., Hiscock, A., and Kirby, S.M., 2019, Quaternary geology of the Utah FORGE site and vicinity, Millard and Beaver Counties, Utah, *in* Allis, R., and Moore, J.N., editors, Geothermal characteristics of the Roosevelt Hot Springs system and adjacent FORGE EGS site, Milford, Utah: Utah Geological Survey Miscellaneous Publication 169-B, 21 p., 2 appendices, https://doi.org/10.34191/MP-169-B.

Knudsen, T.R., 2024, Interim geologic map of the Parowan quadrangle, Iron County, Utah: Utah Geological Survey Open File Report 764, 21 p., 2 plates, scale 1:24,000, https://doi.org/10.34191/OFR-764.

Lund, W.R., Christenson, G.E., Batatian, L.D., and Nelson, C.V., 2020, Guidelines for evaluating surface-fault-rupture hazards in Utah, *in* Bowman, S.D., and Lund, W.R., editors, Guidelines for investigating geologic hazards and preparing engineering-geology reports, with a suggested approach to geologic-hazard ordinances in Utah, second edition: Utah Geological Survey Circular 128, p. 31–58, https://doi.org/10.34191/C-128.

McDonald, G.N., Kleber, E.J., Hiscock, A.I., Bennett, S.E.K., and Bowman, S.D., 2020, Fault trace mapping and surface-fault-rupture special study zone delineation of the Wasatch fault zone, Utah and Idaho: Utah Geological Survey Report of Investigation 280, 23 p., https://doi.org/10.34191/RI-280.

McKean, A.P., 2020, Geologic map of the Goshen Pass quadrangle, Utah County, Utah: Utah Geological Survey Map 286DM, 14 p., 2 plates, scale 1:24,000, https://doi.org/10.34191/M-286DM.

McKean, A.P., and Anderson, Z.W., 2024, Interim geologic map of the Salt Lake City North quadrangle, Salt Lake and Davis Counties, Utah: Utah Geological Survey Open-File Report 768DM, 38 p., 2 plates, scale 1:24,000, https://doi.org/10.34191/OFR-768DM.

McKean, A.P., Kowallis, B.J., Christiansen, E.H., Bradshaw, R.W., and Harbor, R.L., 2020, Geologic map of the Allens Ranch quadrangle, Utah County, Utah: Utah Geological Survey Map 287DM, 32 p., 2 plates, scale 1:24,000, https://doi.org/10.34191/M-287DM.

Rowley, P.D., 2005, Interim geologic map of the Beaver 30' x 60' quadrangle, Beaver, Piute, Iron, and Garfield Counties, Utah: Utah Geological Survey Open-File Report 454, 27 p., 1 plate, scale 1:100,000, https://doi.org/10.34191/OFR-454.

Rowley, P.D., Biek, R.F., Hacker, D.B., Vice, G.S., McDonald, R.E., Maxwell, D.J., Smith, Z.D., Cunningham, C.G., Steven, T.A., Anderson, J.J., Ekren, E.B., Machette, M.N., and Wardlaw, B.R., 2019, Interim geologic map of the southwestern quarter of the Beaver 30' x 60' quadrangle, Beaver, Iron, and Garfield Counties, Utah: Utah Geological Survey Open-File Report 686DM, 18 p., 1 plate, scale 1:100,000, https://doi.org/10.34191/OFR-686dm.

Rowley, P.D., Biek, R.F., Hacker, D.B., Vice, G.S., McDonald, R.E., Maxwell, D.J., Smith, Z.D., Cunningham, C.G., Steven, T.A., Anderson, J.J., Ekren, E.B., Machette, M.N., Wardlaw, B.R., Kirby, S.M., Knudsen, T.R., Kleber, E.J., and Hiscock, A.I., 2020, Interim geologic map of the northwestern quarter of the Beaver 30' x 60' quadrangle, Beaver and Piute Counties, Utah: Utah Geological Survey Open-File Report 729DM, 25 p., 2 plates, scale 1:62.500, https://doi.org/10.34191/OFR-729DM.

Rowley, P.D., Williams, V.S., Vice, G.S., Maxwell, D.J., Hacker, D.B., Snee, L.W., and Mackin, J.H., 2006, Interim geologic map of the Cedar City 30' x 60' quadrangle, Iron and Washington Counties, Utah: Utah Geological Survey Open-File Report 476DM, 23 p., 2 plates, scale 1:100,000, https://doi.org/10.34191/OFR-476dm.

Sprinkel, D.A., 2006, Interim geologic map of the Dutch John 30' x 60' quadrangle, Daggett and Uintah Counties, Utah, Moffat County, Colorado, and Sweetwater County, Wyoming: Utah Geological Survey Open-File Report 491DM, 1 plate, scale 1:100,000, https://doi.org/10.34191/OFR-491dm.

Sprinkel, D.A., 2007, Interim geologic map of the Vernal 30' x 60' quadrangle, Uintah and Duchesne Counties, Utah, and Moffat and Rio Blanco Counties, Colorado: Utah Geological Survey Open-File Report 506DM, 3 plates, scale 1:100,000, https://doi.org/10.34191/OFR-506DM.

Sprinkel, D.A., 2024, Geologic map of the Duchesne 30' x 60' quadrangle, Duchesne and Wasatch Counties, Utah: Utah Geological Survey Geologic Map 300DM, 62 p., 2 appendices, 2 plates, scale 1:62,500, https://doi.org/10.34191/M-300DM.

U.S. Geological Survey, undated, Quaternary fault and fold database of the United States: https://www.usgs.gov/programs/earthquake-hazards/faults, accessed 2025.

Utah Geological Survey, undated, Utah Geologic Hazards Portal: https://maps.geology.utah.gov/hazards, accessed November, 2025.

Utah Geospatial Resource Center (UGRC), undated, Utah State Geographic Information Datasource (SGID), Utah Quaternary Faults layer, https://opendata.gis.utah.gov/datasets/utahDNR::utah-quaternary-faults/about, accessed February 2026.